

The following is a complete set of the claims for this patent application, replacing all prior versions.

Claims:

1 Claim 1 (currently amended): An alloy carbon steel comprising iron and a maximum of
2 0.35% by weight of carbon, said alloy carbon steel having a triple-phase microstructure
3 comprising ferrite crystals fused with martensite-austenite crystals, said crystals having
4 grain sizes within the range of about 2 microns to about 100 microns, said martensite-
5 austenite crystals comprising laths of martensite alternating with thin films of austenite,
6 said martensite-austenite crystals ~~austenite~~ and constituting from about 5% to about 95%
7 by weight of said triple-phase microstructure, and said martensite-austenite crystals
8 devoid of carbide precipitates at interfaces between phases.

1 Claims 2-3 (canceled)

1 Claim 4 (original): An alloy carbon steel in accordance with claim 1 in which said
2 martensite-austenite crystals constitute from about 15% to about 60% by weight of said
3 triple-phase microstructure.

1 Claim 5 (original): An alloy carbon steel in accordance with claim 1 in which said
2 martensite-austenite crystals constitute from about 20% to about 40% by weight of said
3 triple-phase microstructure.

1 Claim 6 (original): An alloy carbon steel in accordance with claim 1 in which said
2 carbon constitutes from about 0.01% to about 0.35% by weight of said triple-phase
3 microstructure.

1 Claim 7 (original): An alloy carbon steel in accordance with claim 1 in which said
2 carbon constitutes from about 0.03% to about 0.3% by weight of said triple-phase
3 microstructure.

1 Claim 8 (original): An alloy carbon steel in accordance with claim 1 in which said
2 carbon constitutes from about 0.05% to about 0.2% by weight of said triple-phase
3 microstructure.

1 Claim 9 (original): An alloy carbon steel in accordance with claim 1 further comprising
2 silicon at a concentration of from about 0.1% to about 3% by weight of said alloy
3 composition.

1 Claim 10 (original): An alloy carbon steel in accordance with claim 1 further comprising
2 silicon at a concentration of from about 1% to about 2.5% by weight of said alloy
3 composition.

1 Claim 11 (original): An alloy carbon steel in accordance with claim 1 in which said
2 carbon constitutes from about 0.03% to about 0.3% by weight of said triple-phase
3 microstructure, said alloy carbon steel further comprising silicon at a concentration of
4 from about 0.1% to about 3% by weight of said alloy composition.

1 Claim 12 (original): An alloy carbon steel in accordance with claim 1 in which said
2 carbon constitutes from about 0.05% to about 0.2% by weight of said triple-phase
3 microstructure, said alloy carbon steel further comprising silicon at a concentration of
4 from about 1% to about 2.5% by weight of said alloy composition, and containing
5 substantially no carbides.

1 Claim 13 (withdrawn): A process for manufacturing a high-strength, corrosion-resistant
2 tough alloy carbon steel, said process comprising:

3 (a) forming an alloy composition comprising iron and at least one
4 alloying element comprising a maximum of about 0.35% by weight of carbon in
5 proportions selected to provide said alloy composition with a martensite transition
6 range having a martensite start temperature of at least about 300°C;

- 7 (b) heating said alloy composition to a temperature sufficiently high to
8 cause austenitization thereof, under conditions causing said alloy composition to
9 assume a homogeneous austenite phase with all alloying elements in solution;
10 (c) cooling said homogeneous austenite phase sufficiently to transform
11 a portion of said austenite phase to ferrite crystals, thereby forming a two-phase
12 microstructure comprising ferrite crystals fused with austenite crystals; and
13 (d) cooling said two-phase microstructure through said martensite
14 transition range under conditions causing conversion of said austenite crystals to a
15 microstructure containing laths of martensite alternating with films of retained
16 austenite.

1 Claim 14 (withdrawn): A process in accordance with claim 13 in which step (d)
2 comprises cooling said two-phase microstructure at a rate sufficiently fast to avoid the
3 occurrence of autotempering.

1 Claim 15 (withdrawn): A process in accordance with claim 13 in which step (d)
2 comprises cooling said two-phase microstructure by contact of said two-phase crystal
3 structure with water.

1 Claim 16 (withdrawn): A process in accordance with claim 13 in which step (c)
2 comprises cooling said homogeneous austenite phase to a temperature of from about
3 750°C to about 950°C.

1 Claim 17 (withdrawn): A process in accordance with claim 13 in which step (c)
2 comprises cooling said homogeneous austenite phase to a temperature of from about
3 775°C to about 900°C.

1 Claim 18 (withdrawn): A process in accordance with claim 13 in which said carbon
2 constitutes from about 0.01% to about 0.35% by weight of said alloy composition.

1 Claim 19 (withdrawn): A process in accordance with claim 13 in which said carbon
2 constitutes from about 0.03% to about 0.3% by weight of said alloy composition.

1 Claim 20 (withdrawn): A process in accordance with claim 13 in which said carbon
2 constitutes from about 0.05% to about 0.2% by weight of said alloy composition.

1 Claim 21 (withdrawn): A process in accordance with claim 13 in which said alloy
2 composition further comprises silicon at a concentration of from about 0.1% to about 3%
3 by weight.

1 Claim 22 (withdrawn): A process in accordance with claim 13 in which said alloy
2 composition further comprises silicon at a concentration of from about 1% to about 2.5%
3 by weight.

1 Claim 23 (new): An alloy carbon steel in accordance with claim 1 in which grain sizes
2 are within the range of about 5 microns to about 30 microns.